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Aerial Lifts for Working in Tree Tops

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Engineers at the Missoula Technology and Development Center have identified aerial lifts as the most versatile and safe vehicles for work in tree crowns. Recent improvements in hydraulic and mechanical systems have made these lifts more appropriate for seed orchard tasks. There are two categories of lifts. Vertical-horizontal lifts are either self-propelled or mounted on a trailer or truck; they can be used to reach high places but are limited in the amount of weight they can hold. Vertical lifts are self-propelled units with relatively large platforms. Their height reach is limited to 182.8 m (60 feet), but they can lift up to 12,700 kg (28,000 pounds). Lifts suited for most seed orchard tasks can be rented or purchased. Tree Planters' Notes 45(1):21-25;1994.

Aerial lifts are the most versatile and safe method for working in tree crowns according to a recent investigation conducted by Missoula Technology and Development Center (MTDC) engineers. Forest Service emphasis on tree improvement has increasingly required workers in both orchards and wild stands to accomplish their tasks 9 m (30 feet) or more above the ground. Timber managers want to know the most efficient, safe method for jobs like collecting genetically superior cones and pollen, gathering samples for determining the effects of acid rain, or assessing disease and insect damage.

In 1992, the Washington Office Timber Management Staff Group assigned MTDC the task of investigating the problems associated with working in tree crowns. Center engineers were asked to identify available equipment and determine its safety, economy, and versatility. Many different systems were examined, including bucket and ladder trucks, extendable platforms, fixed towers, tethered balloons, cranes, and portable scaffolding. Their conclusion was that aerial lifts are the most practical, safe method for accomplishing seed orchard tasks. Although aerial lifts have been used for many years, recent improvements in hydraulics and mechanical systems have improved the utility and safety of this equipment. Seed orchard workers and others who must work in the tree crowns should find aerial lifts that meet their particular needs.

Aerial lifts are capable of moving workers or materials from ground level to various elevations up to 30 m (100 feet). They require 1 or 2 people to operate and can cost from $20,000 to $100,000, depending on their sophistication. They are marketed under a variety of different names such as construction lifts, boon lifts, aerial work platforms, and mobile platforms. In general, they can be broken down into two categories; (1) those that raise the load both vertically and horizontally and (2) those that are capable only of vertical lift.

Vertical-Horizontal Lifts

General characteristics. These lifts can be either self-propelled (figure 1), trailer-mounted (figure 2), or truck-mounted (figure 3). The self-propelled units are readily available through construction equipment rental agencies. They must be towed to the work area but are fully mobile once on site. Self-propelled units have a height capability up to 45 m (150 feet) and a life capacity of 227 kg (500 pounds). Most are available with rough terrain features such as oscillating axles, 4-wheel steering, 4-wheel drive, and high-flotation tires. Some designs have a grade capability of up to 25% with the boom retracted and down. Self-propelled units weigh 2,495 to 17,237 kg (5,500 to 38,000 pounds). Trailer-mounted units must be towed at all times. The lift operator must lower and leave the platform even for a short move, unless a second prime mover driver is employed. These units usually have a lower lift capacity (181 kg or 1400 pounds) and lift height (20 m or 65 feet) than self-propelled or truck-mounted units. Trailer units weigh 2,495 to 15,786 kg (5,500 to 35,000 pounds).

Truck-mounted units have the greatest reach (up to 67 m or 210 feet) and are completely mobile. They also require the operator to lower and leave the platform to move the unit if a second operator is not available. Their rough-terrain capability and overall weight are dictated by the type of vehicle on which they are mounted.

Most manufacturers make several types of vertical-horizontal lifts that vary the mechanism used to raise the load. These mechanisms can be telescoping stick booms, telescoping boom sections with articulated joints, or a combination of both (figure 4). Although

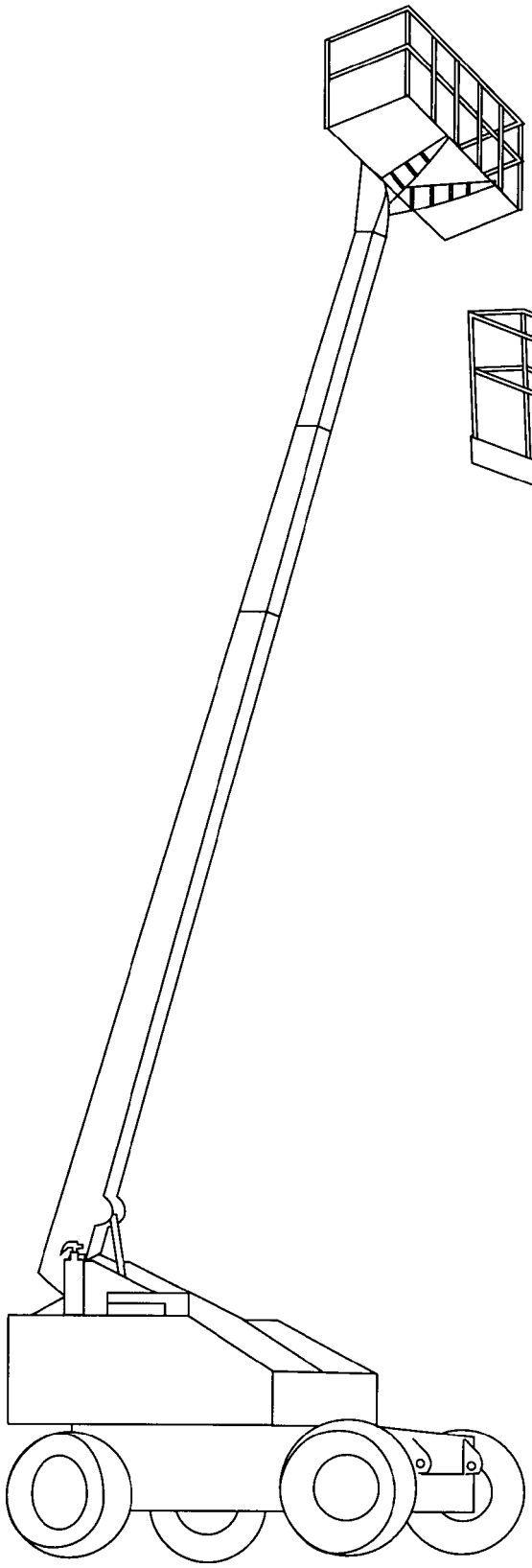

Figure 1—*Self-propelled vertical–horizontal lift.*

each design has its own advantages and disadvantages, seed orchard managers should consider those units with articulated joints or jib booms, or what is sometimes called "extend-a-reach/over-and-down" capability. This allows the operator to raise the boom over a tree and then lower the end section and platform into the crown without moving the boom through the limbs. This is not always possible with a straight stick boom.

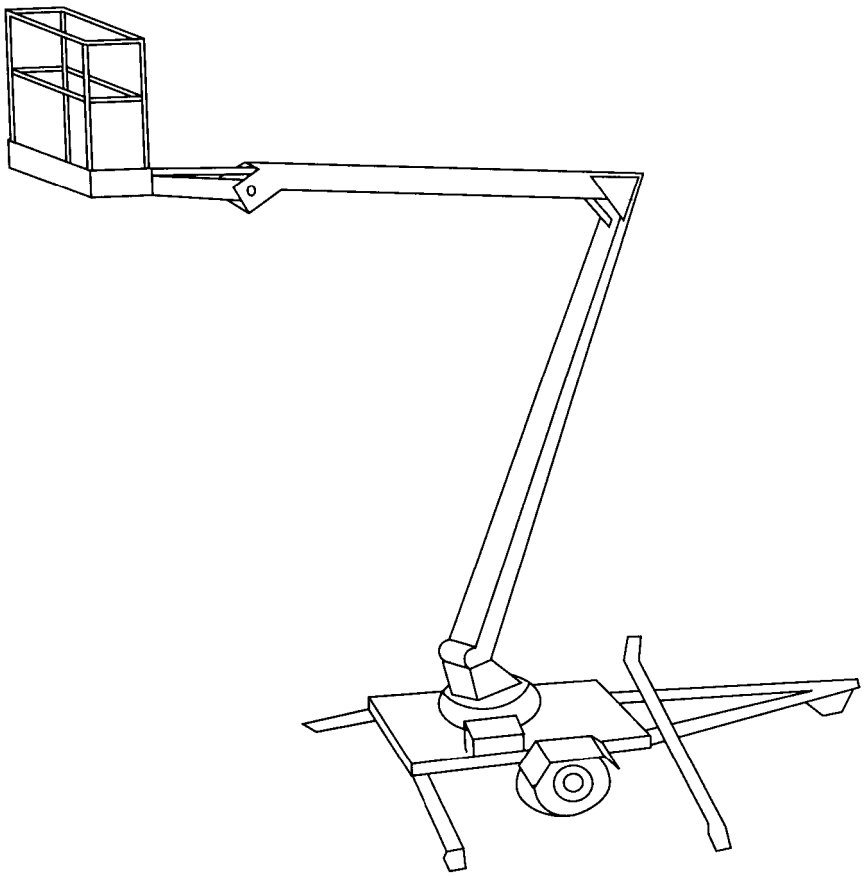

Figure 2—*Trailer-mounted vertical–horizontal lift.*

Platform sizes vary. Trailer-mounted units usually are available with a one-person fiberglass bucket. Self-propelled units use a steel platform generally about 0.7 by 1.5 by 1.1 m (2.5 by 5 by 3.5 feet). Truck-mounted units may have either a bucket or platform.

Vertical-horizontal lift units are available with LPG, gasoline, or diesel engine power. They feature full--function controls in the bucket or platforms, and a duplicate set of ground controls for emergency use. All platforms should have lift sensor-alarms and safety harnesses. Most are self-leveling and can be power rotated. Hydraulic and 110-V AC outlets are available.

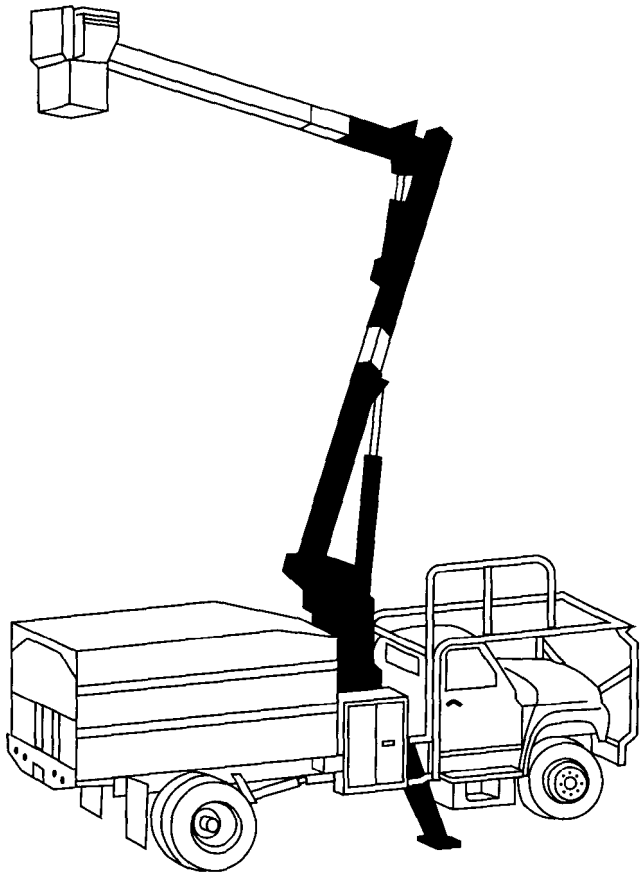

Figure 3—*Truck-mounted vertical–horizontal lift.*

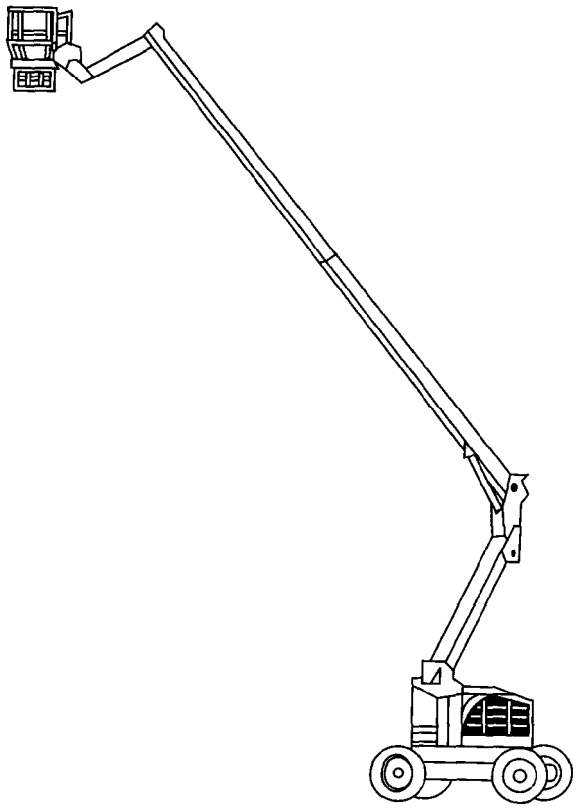

Figure 4—*Tire-mounted vertical–horizontal lift.*

Typical specifications.
Platform height up to 30.5 m (100 ft)
Horizontal reach 15.2 m (50 ft)
Capacity 454 kg (1,000 lbs) restricted, 227 kg (5001bs) unrestricted
Weight 10,433 kg (23,000 Ibs)
Gasoline engine
Platform controls
Ground controls
360-degree rotation
Platform rotator
Oscillating front axle
4-wheel steering
4-wheel drive
Jib boom
4-mph speed
25% gradability (boom down)
0.86 rpm swing speed
Self-propelled
1.1 m (3.75 ft) tail swing
0.7 x 1.5 x 1.1 m (2.5 x 5 x 3.5 ft) platform

Advantages and limitations. Because of their extensive lateral movement, vertical-horizontal lifts allow an operator to work adjacent areas such as the tops of closely spaced trees, without moving the whole machine. This lateral movement capability allows an operator to access tree tops without pushing the work platform through the lower tree branches and to move the machine without fully lowering the platform.

Self-propelled units are capable of being operated and moved by one individual from the work platform. Truck-mounted and trailer-mounted units do not have this capability. In all cases, moving the equipment with the boom extended is limited to 5-degree (or less) slopes.

Vertical-horizontal units have a high reach capability, but usually cannot lift as great a weight as vertical lifts. They also, as a general rule, have smaller work platforms.

The lift operators must work while restrained by a safety belt. All operators should be thoroughly trained. Most dealers and rental organizations offer a 4- to 8-hour training package with each unit.

Vertical Lifts

General characteristics. The majority of these unit are self-propelled (figure 5). Most also are capable of operating on rough terrain with features such as 4-wheel drive and 4-wheel steering, oscillating axles, and super grip tires. Some have a gradability rating of 30% with the platform down.

Most vertical lifts employ a scissors-type mechanism, but there are some designs that utilize folding or telescoping lattice booms. These generally have a working height of less than 9 m (30 feet) and are not considered in this report. Vertical scissors lifts can handle more weight than lifts capable of horizontal movement. Some vertical lifts can raise 1,179 kg (2,600 pounds). Height however is usually limited to 18.3 m (60 feet). These units can weigh up to 12,701 kg (28,000 pounds).

Vertical lifts generally have larger work platforms than vertical-horizontal lifts, with dimensions approaching 1.8 by 3.1 m (6 by 10 feet). Some have manually extendable ends to further increase the work area. Many units have a platform that can be hydraulically moved in a longitudinal direction several feet to facilitate positioning.

Platform accessories include a 5-degree slope tilt sensor with alarm, safety belt, AC and DC power outlets, and platform controls for all functions. LPG, gasoline, or diesel power is available with these units.

Typical specifications.

Platform height up to 18.3 m (60 ft)
Capacity to 680 kg (1,500 lbs)
Gasoline engine
Platform controls
Ground control override
End of platform extendible 0.9 m (3 ft)
Rough terrain capability
Self-propelled
4-mph speed
20% gradability (platform down)
2.1 x 5.2 x 1.1 m (7 x 17 x 3.5 ft) platform

Advantages and limitations. Vertical lifts usually are self-propelled units capable of being operated and moved at the work site by one individual. They usually have larger work platforms than those found on vertical-horizontal equipment and they can also lift more weight.

However, their working height is limited, and they must extend up through the branches to reach the top of trees. This requires the platform to be lowered before the unit can be moved to adjacent trees. And, because there is limited lateral movement, the work area from one setting is limited. Therefore, the operator must move the complete unit more often than would be necessary with a vertical-horizontal machine.

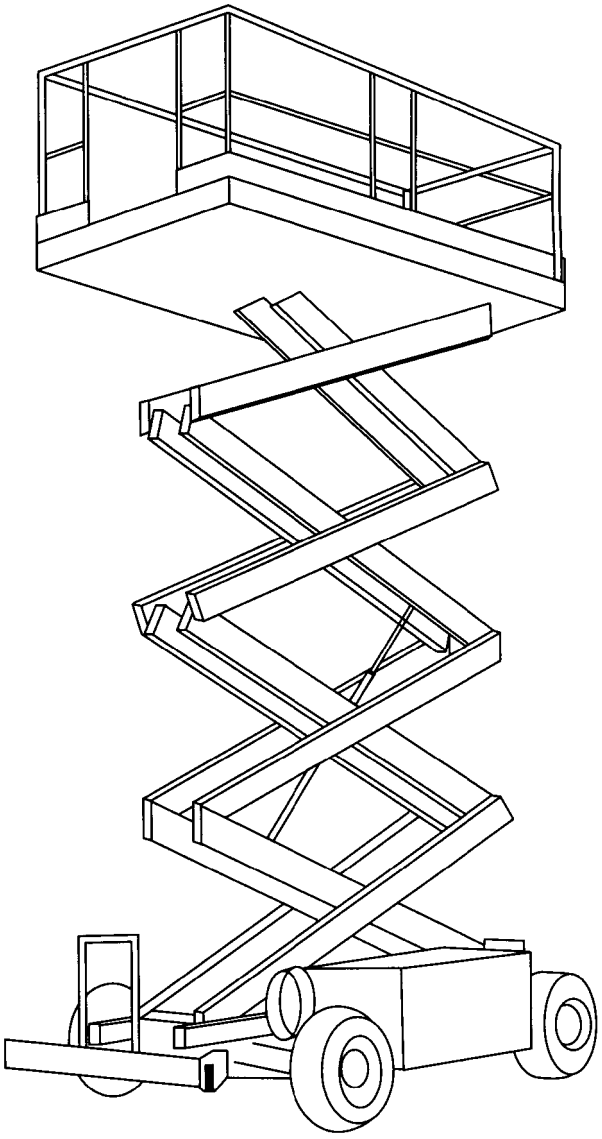

Figure 5—*Self-propelled vertical scissors lift.*

As with the vertical-horizontal units, the operator must work while restrained by a safety belt. All operating personnel should attend a training session before working with this equipment. Also, as with the other lifts, the operation of vertical lifts is limited to a 5-degree maximum slope.

Summary

Supervisory personnel should carefully analyze the job to be done before deciding on the type of machine

to rent or purchase. Aerial lifts offer a wide range of capabilities and advantages, but each also has its disadvantages and limitations. Choosing the most suitable aerial lift can create a safe work environment, reduce labor costs, and accelerate or expand the working being done.

For current information on specific products, please contact the following manufacturers:

Snorkel
PO Box 65
St. Joseph, MO 64504-0065
(913) 989-4481

JLG Industries, Inc.
JLG Drive McConnellsburg, PA 17233-9502
(717) 485-5161

Genie Industries
PO Box 69
Redmond, WA 98052
(206) 681-1800

Simon Aerials, Inc.
10600 West Brown Deer Road
Milwaukee, WI 53224
(414) 355-0802

Calavar Corp.
PO Box 21447
Waco, TX 76702-1447
(817)666-4545

Mayville Engineering Co.
715 South Street
Mayville, WI 53050-1810
(414) 387-4500

Aero Lift
15 Fairfield Place
West Caldwell, NJ 07006
(201) 575-7487

Hi-Ranger, Inc.
PO Box 177
Waukesha, WI 53187-0177
(414) 547-1000